



Placement of Implants into Infected Extraction Sites

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Introduction

Dental implants can be placed immediately into healthy extraction sites with high success and survival rates.^{1,2} It has been suggested, however, that immediate placement of implants into infected extraction sites is contraindicated due to the pathology interfering with osseointegration resulting in decreased implant survival and success.³ With many potential implant sites presenting with a pre-existing periapical or periodontal infection, treatment protocols have been advocated for immediate placement of implants in these infected sites. Advancements in surgical techniques and implant surface technology have made immediate placement of implants a more predictable and accepted treatment option; however, there is still debate about whether infected extraction sites should be used for immediate implant treatment approaches. The purpose of this clinical update is to report on the success and survival of implants placed immediately into infected extraction sites.

Implants Placed into Infected Sites

Immediate or delayed implant placement can be considered when a tooth with poor prognosis is scheduled for removal. Presence of risk factors such as smoking and systemic diseases which may interfere with wound healing and a positive outcome need to be identified. Local factors including presence of infection, deficient soft tissue profile, insufficient bone width, height and quality must also be thoroughly investigated during the treatment planning process. Infected sites must be further evaluated for the type (acute, chronic, periodontal, endodontic, or combination), size and location of an infection and ability to thoroughly debride the proposed implant site intra-operatively. In addition, the use of antibiotics, bone grafting materials and biologic mediators (i.e. growth factors) should be considered.

What is Success and Survival of Implants?

Implant success and survival are often used as outcome measures when evaluating and comparing various dental implant procedures including immediate implant placement in infected sites. The success of implants is often based on Albrektsson's 1986 criteria which state that there should be no implant mobility, no peri-implant radiolucency and the absence of pain, infection and paresthesia.⁴ Additionally, there should be no violation of the mandibular canal and vertical bone loss should not exceed 0.2mm annually after one year in function. Implant survival, on the other hand, simply implies the existence of the implant in the site and does not imply defined clinical criteria.⁵

Histologic Outcomes

The immediate placement of implants into infected sites was first described in a dog model and provided a histologic evaluation of bone to implant contact.⁶ After 12 weeks of healing there was no statistical difference in bone to implant contact between immediate implants in infected and non-infected sites and both groups demonstrated 100% implant success. Chang⁷ also utilized a dog model to compare the histologic outcome of implants placed into a healthy control site and two test sites with peri-apical radiolucencies. Histological examination of the apical one-third of the implant fixtures at 12 weeks post-placement found evidence of

osseointegration of all implants, however, the bone to implant contact was greater in healthy extraction sites (76.03%) compared to infected sites with (59.55%) and without a membrane (48.62%). All implants were successful and there were no signs of infection or peri-implant radiolucency around any of the implant fixtures. Both authors concluded that it is possible for implants to be placed in infected sites with clinical success that would lead to implant survival.

Human Case Reports and Case Series

Casap⁸ placed 30 implants immediately into extraction sites presenting with various types of pathology including subacute periodontal infection, chronic periodontal infection, periodontal cyst, chronic periapical lesion and perio-endo infection. Extraction sites were thoroughly debrided, implants were placed using a two stage approach and pre- and post-surgical antibiotics were administered. Only 1 implant failed to integrate. The remaining implants were in function over a 12 to 72 month follow up period yielding an implant survival rate of 96.7%. In one of the largest reported sample sizes, Fugazzotto⁹ reported a retrospective analysis of 418 implants placed immediately in infected sites with periapical pathology. All implants were followed for a minimum of 24 months with a mean follow up time of 67.3 months. Surgical protocol included thorough socket debridement and post-operative antibiotics. Only 5 implants were lost or demonstrated progressive bone loss resulting in a cumulative survival rate of 97.8%.

A common finding associated with infected extraction sites can be partial or complete loss of buccal bone. Marconcini¹⁰ presented a case series of 20 implants placed immediately into sites exhibiting partial or complete loss of the buccal plate in 13 patients. Following socket debridement, primary stability of implants was achieved and buccal bone defects were grafted with cortico-cancellous porcine bone and a collagen barrier membrane. Implants were restored at 4 months and at 12 months post-treatment implant survival and success were 100% with mean crestal bone loss of 0.5mm. The results show that implants can be successfully placed immediately into extraction sites compromised by both infection and buccal bone loss with acceptable clinical outcomes.

Comparative Human Studies

Crespi¹¹ compared implants placed immediately in healthy sites (n=15) to those placed in sites with periapical lesions but without fistulas or suppuration (n=15). In addition to the use of pre- and post-operative antibiotics, the surgical protocol for all implants required an insertion torque ≥ 25 Ncm and primary closure after implant placement utilizing a 2 stage surgical approach. Implant survival was 100% for both groups at 24 months and there were no significant differences in bone loss, plaque index, bleeding index, keratinized gingiva or probing depth between the groups.

Bell¹² reported a retrospective chart review of 655 patients with 922 implants placed immediately into extraction sites. Two hundred and eighty five implants were placed into sites exhibiting chronic periapical infections while the remaining 637 implants were placed in sites exhibiting no periapical pathology. There was no significant difference in implant success between the infected sites (97.5%) and

healthy sites (98.7%) over a mean follow up time of 19.75 months. When looking at factors associated with implant failure, it was found that there was a statistically higher failure rate for implants placed adjacent to retained teeth that had residual periapical radiolucencies.

Fugazzotto¹³ completed a retrospective analysis of 64 patients that is the only comparison of immediate implants in healthy and infected sites in the same patient. All patients in this analysis had implants placed immediately in the maxillary anterior region with at least one implant placed into a healthy extraction site and at least one implant placed into a site exhibiting periapical pathology. Twenty-six of the patients had implants placed at the healthy and infected sites at the same visit. The remaining patients had the therapies completed at different visits ranging from 2 to 35 months apart. Implant survival was assessed after implants had been restored and in function for at least 24 months with a mean follow up time of 64 months. No implants were lost during the observation period although one implant in each group exhibited buccal recession > 2mm which was deemed a failure. There was no significant difference in the cumulative survival rates for the infected sites (98.1%) and the healthy sites (98.2%).

Immediate Provisionalization and Loading

Demands from patient and provider to expedite treatment and reduce the need for removable interim prostheses have led to increasing interest in immediate provisionalization of implants, especially in the esthetic zone. Immediate implants in infected sites can be considered for these accelerated treatment approaches as well. Meltzer¹⁴ attempted immediate implant placement into 77 periodontally and endodontically infected sites with immediate provisionalization of the implants. Extraction sites were thoroughly debrided prior to implant placement and primary stability of all implants was achieved with insertion torques of 90-100 Ncm and implant stability quotients (ISQ) of 72-85. Implant survival was 98.7% over a 3 to 24 month follow up period.

Immediate occlusal loading of implants placed into infected extraction sites has also been shown to be successful and predictable. Crespi¹⁵ completed a 4 year follow up on implants immediately loaded after placement into healthy (n=78) and infected (n=197) extraction sites. As with previously described studies, thorough debridement of the extraction sites was completed and systemic antibiotics were administered. Primary stability with an insertion torque >35Ncm was achieved for all implants. Patients were placed on a 6 month maintenance recall and at 4 years post-treatment implant survival was 100% in the non-infected group and 98.9% in the infected group. No pain, suppuration or mucositis was present around any surviving implant and mean bone loss was not significantly different between the healthy (0.78mm) and the infected (0.79mm) groups.

Conclusion

Immediate placement of dental implants into infected sites can be a successful and acceptable treatment option provided there is proper case selection and treatment protocol. As with any dental implant procedure, the systemic health of the patient and smoking status can affect treatment success. Surgical protocols should include thorough debridement of the infected extraction site prior to implant placement and obtaining primary stability of the implant fixture. Additionally, the administration of systemic antibiotics, either pre-operatively or post-operatively, has been utilized in all of the published literature. With the desire of both patients and clinicians to expedite treatment and reduce the number of surgical procedures, immediate placement of dental implants into infected sites should be considered as a viable treatment option for selected cases.

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